already made on the provision of instruments for measuring and recording temperatures above the range of the mercurial thermometer. Without the electrical pyrometer comparatively little would have been accomplished.

Another subject of the greatest chemical and commercial importance is the utilisation of atmospheric nitrogen, which has been treated in a complete and interesting article by Prof. Crossley. Up to the present the fixation of nitrogen in the form of nitrate has perhaps attracted most attention, and has been practised on the largest scale, but the recent announcement that the Badische Anilin- u. Soda-Fabrik has actually started the manufacture of ammonia from the combination of gaseous nitrogen and hydrogen by Haber's process is a further step of great significance.

Among other new subjects unrepresented in the former edition are "Colloids," by Dr. J. C. Philip, and "Corrosion and Fouling of Steel and Iron Ships," by Prof. Vivian B. Lewes; while several others, such as "Explosives," by Mr. G. H. Perry, and "Matches," by Mr. E. G. Clayton, have been largely added to and brought up to date. There is also a judicious unsigned historical article on the liquefaction of gases.

There are few deficiencies apparent on first acquaintance with the dictionary, and in the presence of so much that is admirable, hypercriticism may be deprecated. The inequality in length of the various articles is probably one of the most difficult questions which come before the editor in relation to such a work as this. The most glaring case noticeable in the two volumes before us is the assignment of 100 pages to naphthalene, while fuel receives only twenty-four pages and flame eight pages. In neither of these articles is there any reference to the important question of smoke production and prevention, which is surely a question of chemical as well as practical interest.

The attention of the editor may also be directed to the fact, though too late for remedy, that the article on essential oils, though containing much useful information, is distinguished from every other important article in the book by the absence of references or bibliography. It would probably provide a slight shock for Prof. Wallach to find that an article on this subject could be written without mention of his name. The writer of the article similarly ignores Schimmel's half-yearly reports, which furnish a large body of valuable information extending over many years, and cannot yet be considered to be replaced in this country by *The Perfumery and Essential Oil Record.*

All British chemists will certainly make frequent use of the new edition of the dictionary, and in doing so the majority will be glad of the adoption of a system of abbreviations of the titles of journals and books which is practically identical with the system with which all are familiar in the publications of the Chemical Society, and is much to be preferred to the contractions, often rather tiresome, used in the previous edition.

W. A. T.

PRACTICAL MATHEMATICS.

(1) *Practical Geometry and Graphics.* By E. L. Bates and F. Charlesworth. Pp. ix+621. (London: B. T. Batsford, 1912.) Price 4*s.* net.

(2) *Practical Mathematics.* By E. L. Bates and F. Charlesworth. Pp. ix+513. (London: B. T. Batsford, 1912.) Price 3*s.* net.

(3) *Analytical Geometry. A First Course.* By C. O. Tuckey and W. A. Nayler. Pp. xiv+367. (Cambridge: University Press, 1912.) Price 5*s.* net.

(4) *A Preparatory Arithmetic.* By C. Pendlebury. Pp. xiv+185+xxx. (London: George Bell and Sons, Ltd., 1912.) Price 1*s.* 6*d.*

(5) *Les Anaglyphes Géométriques.* By H. Vuibert. Pp. 32. (Paris: Librairie Vuibert, n.d.)

(1) THE contents of this volume fall into three sections: (*a*) plane geometry; (*b*) graphics; (*c*) descriptive geometry. The first deals with the calculation of areas and volumes, the fundamental geometrical constructions and the chief properties of the circle and conic. In the second the student is shown how to apply graphical methods to the solution of practical problems in mechanics, considerable space is devoted to the consideration of harmonic motion and systems of frameworks, and allusion is made to the use of vector products. The last section, which occupies nearly 200 pages, contains as full an account of the methods of practical solid geometry as any ordinary technical student is likely to require. The diagrams are clear and the quality of the examples is distinctly good.

(2) The authors have attempted to collect in as concise a form as possible all those portions of mathematics which are likely to be of use to practical students. The volume is self-contained in the sense that no previous knowledge is assumed, and its contents are designed to supply material for a course lasting between two and three years. About two-thirds of the book is devoted to arithmetic, algebra and geometry; due prominence is given to graphical methods; the treatment of mensuration is excellent, and the selection of those geometrical properties and ideas with which it is considered students should be familiar has been made with great care. The concluding part of the

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book develops the fundamental ideas of trigonometry, vector geometry, mechanics, and the calculus. Considerations of space have made this section somewhat brief, but it should prove useful to those who regard it as an introduction to more advanced text-books.

(3) The distinguishing feature of this work is the early introduction of the equations of curves of the second and higher degrees. It is an undoubted fact that if a student is compelled to make himself thoroughly familiar with the analytical geometry of the straight line and circle before proceeding to other loci, he finds it hard to appreciate the purpose and the value of the work in which he is engaged. The boy who intends to specialise in mathematics will not derive any harm from pursuing this course; in fact, there is much to be said for giving him a sound grounding in the elementary principles at the outset; but those who are taking scientific or engineering courses, and therefore require less manipulative skill, secure what they need from a course which is less detailed and more general in character. Their requirements are met admirably by such a treatment as is given in the work before us. This will be made clear by a brief enumeration of the subjects and the order in which they are taken: (1) standard equations of the straight line, circle, ellipse, parabola, hyperbola; (2) gradient of curves; (3) locus problems; (4) polar coordinates with applications to the limaçon, cardioid, cycloid, etc.; (5) the conic based on the focus-directrix definition; (6) the solid geometry of the plane, straight line, and simple curved surfaces.

There is an excellent collection of examples, answers to which are given at the end of the book. We would suggest that an index should be added in future editions.

(4) During the last ten years a number of valuable reports on the teaching of elementary mathematics have been issued by the Mathematical Association, and they have exercised a very considerable influence on the curriculum and the methods employed. As evidence of this it is necessary only to refer to the changes which examining bodies have made in their regulations and to the alteration in character of modern text-books. The present work is based on the report dealing with the teaching of arithmetic in preparatory schools. Concrete and abstract questions are taken side by side, those parts of the subject which are of small intrinsic importance are omitted, and the artificial divisions of the subject-matter into a number of standardised types of problems are avoided. We have no hesitation in recommending this book for use with junior students.

(5) This pamphlet describes a means of exhibiting three-dimensional figures, examples of which were shown at the International Congress at Cambridge last August. Two perspective figures are drawn close together on the paper in the complementary colours green and red, and they are viewed through red and green transparent screens. A highly striking effect is obtained. It is clear that the simplicity of the method will contribute largely to its practical utility. For purposes of demonstration, in the teaching of solid geometry, it should be invaluable. About thirty examples are given; the diagram which represents a cube with one diagonal vertical with its plan and elevation is particularly good. The figures of the cylinder seen from one end and the section of a tetrahedron by parallel planes appear to be a trifle out of drawing.

OUR BOOKSHELF.

Télégraphie sans Fil: Reception des Signaux horaires et des Télégrammes météorologiques. By Dr. Pierre Corret. Pp. 93. (Paris: Maison de la Bonne Presse, n.d.) Price 1 franc.

THIS little volume gives simply-worded directions for the construction of apparatus that will enable persons interested to make use of the time signals dispatched regularly from the wireless telegraph station at the Eiffel Tower. The author begins with a description of the very simple apparatus required by a Parisian amateur, and gives a clear account, with fully detailed examples, of the time signals and the meteorological messages from the tower. From his story of a day's programme of the tower, including as it does telegraphic exercises with other French stations as well as regular service messages, it would appear that the amateur in the French capital has excellent opportunities of learning Morse with a very small outlay on apparatus.

The next two sections of the book give instructions for erecting a receiving station of sufficient sensitiveness to pick up the messages at distances of two or three hundred miles from the tower. These directions are plain and sufficient. With the apparatus described, a French amateur may listen to a great variety of Spanish, Italian, German, and English messages; and an entertaining programme is made out for him in the book. Here the information conveyed is just such as will help those amateurs who are in a state of mental fog as regards the origin of the signals they listen to, and the information will be almost as useful to English as to French amateurs. The book closes with an account of the system of signalling time adopted by the international conference of October last.

It is intended that different stations shall transmit certain signs at different hours. Those normally audible in England are Paris at midnight and 10 a.m., Norddeich at midday and 10 p.m. At present, it may be remarked, the Paris signals indicate 10.45 a.m. and 11.45 p.m.

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